

REMARKS

This paper responds to the Office Action mailed on December 5, 2006.

No claims are amended, no claims are canceled, and claims 28-53 are added; as a result, claims 8-53 are now pending in this application.

§103 Rejection of the Claims

Claims 8-27 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,562,698 to Manor (hereinafter, "the Manor '698 reference") in view of U.S. Patent No. 6,420,245 to Manor (hereinafter, "the Manor '245 reference") and further in view of U.S. Published Application No. 2001/0034564 to Jones (hereinafter, "the Jones reference"), and further in view of U.S. Published Application No. 2002/0086137 to Brouillette *et al.* (hereinafter, "the Brouillette reference"). Applicants disagree with the stated grounds of rejection and desire to further clarify various distinctions of the present invention over the cited art. Reconsideration of the present application is therefore requested in light of the present amendment and following remarks.

The Examiner has cited the Manor '245 reference as pertinent to the patentability of claims in the present application. Manor '245 discloses a method and an apparatus for singulating semiconductor wafers. The method includes directing a laser at a layer positioned on the wafer, and absorbing the radiant energy into the layer from the beam to form scribe lines extending across a surface of the wafer. The wafer is then singulated by moving a saw blade along the scribe lines. The Manor '245 reference provides that the radiant energy provided to the layer has a relatively short wavelength so that the radiant energy is strongly absorbed in the surface layer, and relatively minimally absorbed by an underlying silicon substrate. (Col. 4, lines 30-34). One suitable laser device that irradiates in the far-infrared region of the spectrum is a CO₂ laser, which radiates at a wavelength of about 10.6 microns. (Col. 4, lines 35-40). The absorption of the laser radiation is therefore greater for the surface layer than for the underlying silicon substrate material by "about an order of magnitude". The upper layer of the wafer includes "a combination of passivation layers, dielectrics, oxides nitrides and metal pads." (Col. 4, lines 15-18). A total thickness of the foregoing combination "is usually less than 20 microns."

The Manor '245 reference teaches that the laser removes substantially all of the surface coatings, so that the improved BSC ("backside chipping") results from *the removal of all of the coating layers* that typically clog a dicing blade that singulates the wafer. (Col. 6, lines 38-41).

The Applicant therefore understands the Manor '245 reference to teach forming scribes in a wafer having a depth of less than 20 microns, since the radiant energy is selected to be strongly absorbed by the surface layer, and relatively minimally absorbed by the underlying silicon.

The Examiner has also cited the Manor '698 reference. Manor '698 discloses a method for singulating semiconductor wafers by directing first and second laser devices at a substrate that includes a coating layer. With reference to Figure 4A, coating layers 106 are formed on a substrate 100. The layers 106 are "usually about 10 microns thick". (Col. 5, lines 55-56). Streets 102 are formed in the coating layers by exposing the layers 106 to a first focused laser light 302 having a first wavelength that is preferentially absorbed by the layers 106, as shown in Figure 4B. In Figure 4C, a second focused laser light 332 having a second wavelength that is preferentially absorbed by the substrate material to form a cut 350 in the substrate 100.

The Examiner has also cited the Jones reference. Jones discloses a method for forming a continuous curved edge on a substrate material, and in particular, to a slider employed in a disk drive head by exposing an edge of the slider to laser light. Specifically, the Examiner cites the Jones reference for disclosing the formation of scribe lines in a disk drive slider using one of a saw and a laser, as shown in paragraph 29. Applicant notes, however, that the Jones reference is silent regarding the formation of a scribe depth.

Finally, the Examiner has cited the Brouillette reference for allegedly teaching the formation of a scribe groove in a wafer to a depth "of about half the thickness of the wafer or until the remaining wafer becomes 30 microns thick". Although the Examiner maintains that this teaching is found in paragraph 2 of the Brouillette reference, Applicant cannot find this teaching. Instead, the Brouillette reference discloses a "...dicing step...carried out by a half-cut method in which the wafer, as a single body, is diced to $\frac{1}{2}$ of the thickness of the wafer or diced until the remaining wafer becomes about 30 μm thick...". (Paragraph 2). The process described therein is merely a description of a *conventional* die singulation method, wherein the wafer is partially cut, and then separated (*i.e.*, "singulated") by applying an external force to the wafer along the cut line to break the wafer along the cut line. Applicant submits that the alleged

teaching does not refer to a *scribing* step. Instead, it refers to a *singulation* step. Applicant can find no applicable teaching in the Brouillette reference that discloses forming a scribe having a prescribed depth.

Turning now to the claims, distinguishing differences between the claim language and the prior art will be specifically pointed out. Claim 8 presently recites in pertinent part: "...scribing a workpiece with a laser *to form a scribe having a depth of at least 25 microns...*" (Emphasis added). The applied art, when considered either singly or in combination, simply does not teach this. Claim 8 is therefore allowable over the cited art. Claims depending from claim 8 are also now in allowable form, based upon the allowable form of the base claim and further in view of the additional limitations recited in the dependent claims.

Claim 13 presently recites in pertinent part: "...scribing a workpiece with a laser along a saw street *to form a scribe having a depth of at least 25 microns...*" (Emphasis added). Claim 13 is now therefore allowable over the cited art. Again, the prior art, taken either singly or in combination, does not disclose this. Claims depending from claim 13 are also now in allowable form, based upon the allowable form of the base claim and further in view of the additional limitations recited in the dependent claims.

Claim 16 presently recites in pertinent part: "...scribing a workpiece with the laser *to form a scribe having a depth of at least 25 microns...*" (Emphasis added). Again, the applied art, when considered either singly or in combination, simply does not teach this. Claim 16 is now therefore allowable over the cited art. Claims depending from claim 16 are also now in allowable form, based upon the allowable form of the base claim and further in view of the additional limitations recited in the dependent claims.

Claim 24 presently recites in pertinent part: "...partially ablating a saw street in the substrate with a laser *to form a scribe having a depth of at least 25 microns...*" (Emphasis added). Again, the applied art, when considered either singly or in combination, simply does not teach this. Claim 24 is now therefore allowable over the cited art. Claims depending from claim 24 are also now in allowable form, based upon the allowable form of the base claim and further in view of the additional limitations recited in the dependent claims.

Claims 28-53 are new. No new matter has been introduced through the introduction of claims 28-53.

Reservation of Rights

In the interest of clarity and brevity, Applicant may not have addressed every assertion made in the Office Action. Applicant's silence regarding any such assertion does not constitute any admission or acquiescence. Applicant reserves all rights not exercised in connection with this response, such as the right to challenge or rebut any tacit or explicit characterization of any reference or of any of the present claims, the right to challenge or rebut any asserted factual or legal basis of any of the rejections, the right to swear behind any cited reference such as provided under 37 C.F.R. § 1.131 or otherwise, or the right to assert co-ownership of any cited reference. Applicant does not admit that any of the cited references or any other references of record are relevant to the present claims, or that they constitute prior art. To the extent that any rejection or assertion is based upon the Examiner's personal knowledge, rather than any objective evidence of record as manifested by a cited prior art reference, Applicant timely objects to such reliance on Official Notice, and reserves all rights to request that the Examiner provide a reference or affidavit in support of such assertion, as required by MPEP § 2144.03. Applicant reserves all rights to pursue any cancelled claims in a subsequent patent application claiming the benefit of priority of the present patent application, and to request rejoinder of any withdrawn claim, as required by MPEP § 821.04.

CONCLUSION

Applicant respectfully submits that the claims are in condition for allowance, and notification to that effect is earnestly requested. The Examiner is invited to telephone Applicant's attorney at (612) 349-9587 to facilitate prosecution of this application.

If necessary, please charge any additional fees or credit overpayment to Deposit Account No. 19-0743.

Respectfully submitted,

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Date

13 Feb '07

By


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CERTIFICATE UNDER 37 CFR 1.8: The undersigned hereby certifies that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail, in an envelope addressed to: Mail Stop Amendment, Commissioner of Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on this 13 day of February 2007.

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